Ozark Watershed Ecosystem

Ecosystem Description and Team Mission

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The Ozark region is approximately 50,000 square miles in size, located in the states of Arkansas, Oklahoma, Missouri, and a small portion of Kansas. It is a dome shaped uplift composed of four distinct areas: Boston Mountains, St. Francois Mountains, Salem Plateau, and Springfield Plateau. The uplift is characterized by horizontal bedrock, numerous caves, and several streams or rivers flowing out in all directions.

The Ozarks are bordered on the southwest by the Neosho River, on the south by the Arkansas River, the Black River on the east, and the Osage and Missouri Rivers form the northern boundary. The Ozark region is characterized by thin, rocky soils; numerous caves and associated sink holes, springs, and underground rivers; clear, cool streams; and waterfalls.

The main vegetation found in the region is upland oak-hickory forest, although shortleaf pine does occur on escarpments to the north and on the drier south slopes. Red cedar glades are located on xeric exposures and beach-maple forests are found in cool, moist north-facing ravines. Bottomland hardwoods are found in the floodplain of large rivers. This large expanse of timberland provides breeding habitat for numerous species of neotropical migratory birds.

This ecosystem is easily the most biologically and botanically diverse region of the nation. While much of this ecosytem's unique biological and botanical diversity is still comparable to that of pre-settlement conditions, the area has experienced significant alteration by humans. However, because of the region's geological and ecological stability throughout much of the area, this is one of the most recoverable ecosystems in the country. Other communities represented include shortleaf pine forest; limestone, sandstone, dolomite, and rhyolite glades; and numerous "specialty" communities (e.g., fens, cliffs, sinkhole ponds) that provide habitat for numerous federal species of concern and state listed plants and animals.

...the most biologically and botanically diverse region of the nation.
- Ozark Watershed

Farms, Forests and Tourism

Agriculture (wheat, row crops, livestock, fruit, and truck farms) is a well developed land use in the broad, flat uplands with extensive oak-hickory forests remaining in areas of rough rocky terrain. The U.S. Forest Service is a major landowner in the Ozarks, having units composed of the Clark, Mark Twain, and Ozark National Forests. The Current, Eleven-Point, and Buffalo Rivers are designated as national wild and scenic rivers and adjacent lands are managed by the National Park Service. Extensive lead deposits are mined in the northeast portion of the Ozarks, with other mining for zinc, coal, iron, and barite. Tourism is one of the region's chief industries based upon the natural wonders and the hill culture. Trout fishing is a multi-million dollar business, as is the rapidly developing music industry at Branson, Missouri.

Because of the beauty of the Ozarks, the cultural history, and relatively low land prices and development costs, the Ozarks is one of the fastest growing retirement areas in the nation. Unfortunately, however, this trend has resulted in greater threats to the region's rich biological diversity.

One of the major threats to the environment of the Ozarks is water quality reduction and contamination. Numerous threatened and endangered species are located in the Ozarks, generally associated with caves and free flowing streams. Water quality in the future will be impacted by mining operations (metals, sand and gravel, etc.), increased confined animal facilities (chickens, pigs, etc.), residential and industrial wastes, vegetation removal, etc. Many of these water quality problems are due to the interaction of surface and subsurface waters. The key to protecting water quality is to prevent contamination from entering the ground water systems. Contamination that sinks into the ground may quickly reappear in caves, wells, or springs. Another threat is the loss of biodiversity and forest fragmentation by residential development (both urban and rural) and associated support facilities. Other identified threats to this unique ecosystem include: sand and gravel dredging in streams and rivers; soil erosion and deposition into streams and rivers; cessation of ecological processes (e.g., controlled burning) essential to the maintenance of such habitats as oak and shortleaf pine savannahs; invasion by exotic, competing species (e.g., big-head and grass carp, zebra mussel, garlic mustard, purple loosestrife, feral horses and pigs); construction of reservoirs and smaller impoundments on most watersheds; and lack of federal, state, and private funds necessary to conserve and manage the region's rich biological and botanical diversity.

One of the major threats to the environment of the Ozarks is water quality reduction and contamination.

Bald Eagles, Indiana Bats and More

Federally listed species in this ecosystem include the bald eagle, gray and Indiana bats, Ozark cavefish, Niangua darter, cave crawfish, pink mucket and Curtis' pearly mussels, Neosho madtom, Missouri bladder-pod, Geocarpon, Mead's milkweed, eastern prairie fringed orchid, and western prairie fringed orchid. Federal species of concern and candidate species include eastern small-footed bat, Bachman's sparrow, Henslow's sparrow, cerulean warbler, loggerhead shrike, alligator snapping turtle, hellbender, crystal darter, Arkansas darter, ozark shiner, bluestripe darter, stargazing darter, paddlefish, spectacle case, western fanshell, snuffbox mussel, Neosho mucket, scaleshell, Ouachita kidneyshell, salamander mussel, purple liliput,rugged hornshell, Albarufan dagger moth, artesian agapetus caddisfly, Missouri glyphopsyche caddisfly, Kit's neotrichian caddisfly, contorted ochrotrichian microcaddisfly, Ozark snaketail dragonfly, Frison's seratellan mayfly, central Missouri cave amphipod, Barr's cave amphipod, Clanton's cave amphipod, subtle cave amphipod, pink planarian, Tumbling Creek cavesnail, auriculate false foxglove, Skinner's false foxglove, reed bent grass, Bush's poppy mallow, Ozark chinquapin, tall larkspur, French's shooting star, butternut, bifid phlox, Hall's rush, royal catchfly, bald grass, Ozark spiderwort, and Ozark wake robin. In addition to these species, the Ozark Highlands provides habitat for numerous state listed plants and animals. Within the Ozark Highlands, 56 species and subspecies of fish, 14 species of amphibians and reptiles, 20 species and subspecies of crayfish, 23 species and subspecies of mussels, and over 100 species of plants are largely restricted to this region.

The Ozark Ecosystem Team, in cooperation with its partners, will strive to enhance and maintain a diverse, healthy, beautiful environment that improves the quality of human life. The Ozark Ecosystem extends into Missouri and Arkansas; so the team is split with members from both Region 3 and Region 4. Region 3 is the lead region for the team

The Ozark Ecosystem team consists of representatives from one National Wildlife Refuge, two Ecological Services Field Offices, five fisheries offices and one law enforcement office.

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Summary of Fiscal Year 1998 Accomplishments

The team had many varied accomplishments through the various field offices. The fish hatcheries met all of their mitigation goals for trout paddle fish and sturgeon. They continued efforts to propagate mussels in captivity. When propagation techniques are perfected, the hatcheries will serve as a refugia for threatened and endangered Ozark Mussel species.

The ecological services offices continued Service efforts to protect and preserve threatened and endangered species in the region. In addition, the Columbia Field Office restored 230 acres of habitat for the endangered bladder pod. The habitat was restored through a partnership with Missouri Department of Conservation (MDC) and The Nature Conservancy. They are also working with MDC and private landowners to restore oak savannahs and oak prairie and to install gates on bat caves used by endangered bat species. The Conway Field Office is working with other federal agencies and the state of Arkansas to complete the White River Basin Study. Mingo National Wildlife Refuge restored 20 acres of bottomland hardwoods on the refuge.

Team Leader Terry Peacock, Refuge Operation Specialist from Mingo National Wildlife Refuge, represented the team at the Environmental Round Table in Wisconsin in November. She met with representatives from the National Park Service, Bureau of Land Management, and the United States Geological Survey. The Round table delegates decided that declining water quality in the Ozarks was the most pressing issue. They will meet again in early 1999 to combine water quality data and to designate on ground sites for further data collection and/or restoration.

Goals for Fiscal Year 1999

Water Quality

The team will compile all available water quality data to determine where we have gaps in data knowledge and to determine the effect of declining water quality on indicator species, threatened and endangered species and recreational fishes. We will seek out an agency or entity to compile data from various state and federal agencies and universities. Some suggestions were the Missouri Resource Assessment Project, the USGS lab in Columbia, Mo., or the Missouri Department of Natural Resources. The data will be used to determine a priority ranking of stream or riverine systems for restoration and recovery.

The individual stations will also participate in the following projects:

- Participate in the Environmental Round Table meetings and partnership opportunities developed.
- Research the extent and cause of documented mercury contamination on Mingo NWR.
- Region 4 will continue to work with various state and federal agencies on the White River Basin study.
- In cooperation with Missouri Department of Conservation, conduct landowner contact programs to improve water quality in Ozark cavefish recharge areas.

Fisheries Mitigation and Aquatic Restoration

The team will work toward several areas of required federal mitigation on fisheries and to provide for restoration of aquatic habitat. Suggested activities for the team include:

■ Having hatcheries included in the recovery plans for aquatic species. The hatcheries often have space available and the biological expertise to propagate threatened and endangered aquatic species or to serve as a refuge for them. We need to promote the idea that hatcheries are not just for raising mitigation fish. They can be used to further the Service's goals on the recovery of endangered species. We should promote the research/studies of aquatic species on fish hatcheries.

■ Assist hatcheries with the completion of propagation plans when they are selected to work with endangered species.

■ We should explore the idea of co-locating fishery management personnel on Fish Hatcheries.

We will continue to seek opportunities to restore riparian corridors on private land.

In addition the individual offices will:

■ Continue to provide mandatory mitigation rainbow trout for Lake Taneycomo in Region 3. They will also provide other mitigation fish to areas in Arkansas and Oklahoma.

■ Continue to do experimental work on mussel rearing in a cooperative effort with the Columbia ES office and Dr. Chris Barnhart of Southeast Missouri State University. Neosho National Fish Hatchery is hoping to provide a refugia in the future in our effort to assist in saving endangered mussels of the Ozarks.

■ Working cooperatively with state and federal agencies under approved management plans continue to provide native walleye, smallmouth bass and other species for in-kind mitigation in the Arkansas and Missouri Ozarks and the White River Basin.

■ Work cooperatively with the Mississippi Interstate Cooperative Resource Association (MICRA) and other state and federal agencies for restoration stocking of paddlefish, sturgeon and other interjurisdictional species at risk.

■ Work cooperatively with the Arkansas State University Ecotoxicology Facility, Southwest Missouri State University, federal and state agencies and other FWS offices to establish refugia, develop propagation techniques and perform life history studies on freshwater mussel species at risk.

■ Provide fish for restoration and recreational stocking on National Wildlife Refuges according to approved management plans.

■ Working with partners, assess the feasibility of using National Fish Hatcheries to study and propagate other "nontraditional" species of plants and animals at risk.

Managing Habitat, Recovering Species

Mingo National Wildlife Refuge is approximately 22,000 acres and is responsible for the management of Pilot Knob National Wildlife Refuge and Ozark cavefish National Wildlife Refuge. The Ecological Services Field Offices are responsible for the recovery of threatened and endangered species and their habitats. The individual offices will complete the following projects:

- Reforest 55 acres of bottomland hardwood forest on Mingo National Wildlife Refuge through a partnership between the National Tree Trust, Mingo NWR, and Mingo Job Corp Center.

- Seek a partnership to complete project inventorying reptiles and amphibians in disturbed versus undisturbed areas on Mingo NWR.

- Seek partnership with Missouri Department of Conservation and other partners to establish a monitoring system for Indiana Bat use at Pilot Knob NWR.

- Seek partnership with Missouri Department of Conservation to census Turnback Cave for Ozark cavefish.

- Continue to protect and conserve the endangered blind Ozark cavefish on Neosho National Fish Hatchery.

USFWS Photo

Neosho Hatchery Cultures Freshwater Mussels

Neosho National Fish Hatchery

The Neosho National Fish Hatchery has been defining and researching culture techniques for freshwater mussels for several years. Through the cooperation of partners within and out of the Service, the first successful rearing of *Lampsillis* species of mussels occurred. These techniques developed on common species of mussels will allow the Service to apply them to many species of mussels already threatened by extinction. **1/98**

Refuge Staff Searches for Deer Hunters Lost on Refuge

Mingo National Wildlife Refuge

Late on the evening of January 11, 1998, Refuge Operations Specialist Terry Peacock was informed that two archery hunters were lost in the refuge. Peacock met with family members of the lost hunters and searched the refuge until midnight. Refuge staff and Missouri Department of Conservation Officer conducted an all-night search but were unsuccessful. A group of 12 people resumed the search at daybreak, and at noon, located the spot where the two hunters had spent the night. A second search was being organized when the two hunters exited the area and were found (about 12:30 p.m.) Both hunters were uninjured but tired. **1/98**

116 Participate in Primitive Weapons Deer Hunt Held at Mingo Refuge

Mingo National Wildlife Refuge

One hundred and sixteen hunters participated in the primitive weapons deer hunt on January 2-3, 1998. They harvested 40 deer. Five volunteers assisted in conducting the hunt. Missouri Department of Conservation conducted a drawing to determine the participants for the hunt. **1/98**

400 Visit Refuge Exhibit at Poplar Bluff Open House

Mingo National Wildlife Refuge

Mingo National Wildlife Refuge operated an information booth at an open house in Poplar Bluff, Missouri. The open house was designed to bring together businesses and government entities together to allow public questions and involvement. Refuge staff set up the Refuge display and handed out information to approximately 400 visitors. **3/98**

Refuge Hosts Fifth Graders During Stoddard County Ecology Days

Mingo National Wildlife Refuge

Refuge staff, a volunteer, and representatives from several other agencies gave presentations to approximately 400 Stoddard County, Missouri, fifth graders during the annual Ecology Days at Mingo National Wildlife Refuge. Students rotated through a series of learning stations during the three-day event. Topics included wetlands, Mingo wildlife, soils, fish resources, and fabulous flora. **4/98**

Turkey Hunters Tagged at Missouri Road Block

Jefferson City Law Enforcement Office

On April 26, 1998, a road block was set up to check hunters and fishermen leaving Missouri along U.S. Highway 63, just north of the Arkansas State line. It was the first Sunday of the Missouri spring turkey season and many hunters were heading home. The Service and Missouri Department of Conservation received complaints that non-resident hunters were killing turkeys in Missouri and not tagging or checking them into an official check station as required by Missouri law. When a poacher fails to tag and check a wild turkey, he will then unlawfully return to take another turkey. The limit of turkeys in the spring season in Missouri is two for the three-week season. The wildlife road block was operated for about four hours, and was manned by law enforcement officers from the Service, Missouri Department of Conservation, U.S. Forest Service, Missouri Highway Patrol, Oregon County Sheriff, and Thayer Police Department. Fifteen violations were cited—nine for wildlife and six for other charges. Seven were charged for turkey violations. Two were written for transporting illegal fish. **4/98**

Missouri Students Taught Resource Topics During Butler County Ecology Days

Mingo National Wildlife Refuge

Refuge volunteers taught environmental education classes to nearly 600 Butler County, Missouri fourth graders at the annual Butler County Ecology Days at Mingo National Wildlife Refuge. Students rotated through a series of stations to learn about wetlands, fabulous flora, fish, animal adaptations, and other resource topics. The event took place over a four day period at and around the Mingo National Wildlife Refuge visitor center. .Refuge staff also spoke to approximately 650 seventh grade students at the annual Earth Days celebration at Lake Wappapello. Rod Hansen gave talks on the Fabulous Flora while Terry Peacock talked about wetlands. **5/98**

Kids Help Mingo Refuge Celebrate Fishing Week

Mingo National Wildlife Refuge

The Refuge hosted a youth fishing tournament for kids 16 and under on June 6, 1998. Approximately 90 youths entered the event. Prizes were awarded for the six longest catfish. Local businesses donated more than $500 in merchandise to be given away as tournament and prizes. A pond was stocked with 1,000 lbs of catfish prior to the event. **6/98**

Neosho National Fish Hatchery stocks 40,000 Fingerling Walleye

Neosho National Fish Hatchery

In a cooperative effort to enhance sport fisheries in Southwest Missouri, the Neosho National Fish Hatchery reared and stocked 40,000 fingerling walleye for release into a Southwest Missouri Federal water project. Neosho reared walleye fry provided by the state of Missouri until the fish reached a large enough size to ensure good survival in a large reservoir system. Neosho also released 25,000 state reared walleye into the reservoir, consolidating state and federal stocking efforts. **7/98**

Missouri Turkey Poachers Apprehended

St. Peters, Mo. Law Enforcement Office

Service Special Agents, working with personnel from the Missouri Department of Conservation and the U.S. National Park Service conducted a covert detail during the spring Missouri turkey hunting season to apprehend wild turkey poachers in the Mark Twain National Forest. Arrests were made and information was gathered that will lead to additional arrests. Violations included over-bags of turkeys, failure to tag turkeys, failure to check turkeys, baiting for migratory doves and waterfowl. **7/98**

Mingo Refuge, Job Corps Begin New Environmental Education Initiative

Mingo National Wildlife Refuge

Mingo National Wildlife Refuge is starting a new initiative that will provide Mingo Job Corps students with a 32-hour environmental education curriculum while incorporating its existing program that reaches approximately 2,000 elementary students annually. A new Environmental Education Specialist has been hired to staff the program. Refuge staff will teach basic classes to elementary classes, but will utilize Job Corps students as aids and to help teach some interactive activities. **8/98**

Refuge Hosts Missouri Hunter Education Classes

Mingo National Wildlife Refuge

Staff and volunteers from Mingo National Wildlife Refuge and the Missouri Department of Conservation conducted a hunter education class for 25 young hunters and a few parents at the refuge. Hunter education classes are mandatory in Missouri. The 10- hour program was taught during two evenings and a Saturday morning. **8/98**

Columbia Field Station Hosts Freshwater Mussel Identification Workshop

Columbia Field Office

The Columbia Ecological Services office sponsored a Meramec River Freshwater Mussel Identification Workshop at Meramec State Park, Missouri, September 9-11. The event allowed professional biologists from federal and state agencies and universities to become acquainted with the basic biology of freshwater mussels, learn techniques used to identify species, and gain hands-on experience with identification. Invited mussel biologists (Malacologists) from Missouri and surrounding states presented slide presentations, designed and attended shell workstations, and led field surveys in the Meramec River for participants. Partners in the workshop included Missouri Departments of Natural Resources and Conservation, Southwest Missouri State University, Missouri Western State College, Ecological Specialists, Inc. **9/98**

Mingo's Wildlife Diversity Displayed at Southeast Missouri Regional Fair

Mingo National Wildlife Refuge

Mingo Refuge staff and volunteers maintained a large display at the Southeast Missouri Regional Fair in Cape Girardeau, Mo., Sept. 13-19, 1998. Staff and volunteers answered questions and provided information to approximately 5,000 visitors. Wildlife items on display included preserved animals found at the refuge, migratory bird bands, volunteer items, deer antlers, and mounted migratory birds and raptors. The refuge also provided an enormous amount of literature and brochures to the public concerning Service activities and programs. **9/98**

Mingo Refuge Assists With Outdoor Sportsmanship Clinic

Mingo National Wildlife Refuge

Charlie Shaiffer and several volunteers from Mingo National Wildlife Refuge assisted the Heartland Gobblers chapter of the Wild Turkey Federation, and the Missouri Department of Conservation by hosting a Becoming an Outdoors Woman (BOW) and a Junior Acquiring Knowledge, Ethics, and Sportsmanship (JAKES) clinic. Elementary students and adult women learned basic skills and events one can enjoy in the great outdoors during the event. **9/98**

Mingo Refuge Web Page Goes On-Line

Mingo National Wildlife Refuge

Mingo National Wildlife Refuge now has its web page on-line. Rod Hansen developed the page and its 56 seperate files and images. Net surfers can now learn about the refuge history, look at the Wilderness Area, review the regulations, view the bird list and many other features. Maps of the refuge and the hunting area are also available as well as volunteer opportunities. **9/98**

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